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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/537,754	REPETTO ET AL.	
	Examiner	Art Unit	
	MIRIAM BERDICHEVSKY	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *6/6/2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/6/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because the reference numeral 24 is not present in the drawings. Correction is required. See MPEP § 608.01(b).

Claim Objections

2. Claims 1, 3-5 and 7 are objected to because of the following informalities: The conversion means labeled "(24)" is not present in the drawings and appears to be (29) of Figure 2. Appropriate correction is required.

3. Claim 36 is objected to because of the following informalities: It is the Examiner's opinion that the word "o" should be "or". Appropriate correction is required.

4. Claim 37 is objected to because of the following informalities: It is the Examiner's opinion that the word "a" is missing before the word "layer". Appropriate correction is required.

Claim Analysis: 35 U.S.C. 112, sixth paragraph

5. Claim 1 meets the three prong test and thus invokes 35 U.S.C. 112, sixth paragraph because:

a. The claim limitation uses the phrase "means for".

b. The phrase "means for" is modified by functional language.

c. The phrase "means for" is not modified by sufficient structure, material or acts for achieving the specified function.

Turning to the specification: the means for supplying combustion support substance into the combustion chamber is a conduit (page 3, lines 6-10) and all of its

equivalents; the means for removal of gaseous combustion products is a conduit (page 3, lines 15-22) and all of its equivalents; the means for selective emission of radiation is a lining (page 2, lines 15-19) and all of its equivalents; the means for conversion of radiation into electrical energy is a photovoltaic cell (page 5, lines 12-15 and all of its equivalents); and the means for igniting the combustion reaction is electrical connections (page 2, lines 5-9) and all of its equivalents.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claim 25 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. A Schottky junction is defined as a metal-semiconductor junction. Silica being an insulator thus it is the Examiner's opinion that the word "silica" in claim 25 should read "silicon" and will be interpreted as such from herein.

Claim Rejections - 35 USC § 103

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1, 4-8, 17-18, 20, 23, 28, 31 and33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870).

As to claim 1, a portable device for the production of electrical energy, comprising a matrix of one or more conversion modules, operating in series or in parallel, each of which comprises:

- a combustion chamber made of material that is able to withstand high temperatures (col. 11, lines 59-60). The Examiner notes that the combustion chamber will be made of material able to withstand high temperatures,
- an injection device connected to said combustion chamber by means of an injection conduit (col. 12, lines 65-67),

- a controller (adjustable inlet valve/fuel pump) of the injection frequency and hence of generated power (col. 11, lines 59-60 and line 67 to col. 12, line 1 and col. 13, lines 19-20),
- means for supplying combustion support substance into the combustion chamber (col. 12, lines 50-51),
- means for the removal of gaseous combustion products (col. 12, lines 1-5),
- means for the selective emission of radiation onto the outer surface of the combustion chamber (emitter lining) (col. 11, lines 62-65). The Examiner asserts that the lining of Horne is equivalent to that of the claimed invention and will emit radiation of which some will radiate onto the outer surface of the combustion chamber,
- means for the conversion of radiant energy into electrical energy (col. 11, lines 55-56),
- means for igniting the combustion reaction (col. 12, lines 10-11),
- characterized in that the combustion chamber (210/196') is enclosed in a conversion chamber (figure 43) within which are maintained sub-atmospheric pressure conditions (col. 11, lines 62-65) and the limitation that a substantial part of the heat developed by the combustion reaction is converted into electromagnetic radiation is functional, does not impart structure and this thus not given patentable weight.

Moreover, Horne teaches in a different embodiment the use of an electrical energy source which reflects out of band energy back to the source (col. 14, lines 55-56). It would have been obvious to emit radiant energy onto the outer surface of the combustion chamber (back to the source) because this energy can be reabsorbed rather than disposed as waste and enhance the overall efficiency of the structure, as taught by Horne (col. 15, lines 7-10).

Regarding claim 4, Horne teaches that the means for the conversion of radiant energy into electrical energy comprise a plurality of photovoltaic cells (col. 1, lines 55-56).

Regarding claim 5, Horne teaches that the selective emission of radiation have a narrow emission band with a peaking correspondence with the wavelength at which the conversion means have the maximum conversion efficiency (col. 1, lines 64-67).

Regarding claim 6, Horne teaches that the lining applied to the outer surface of the power source (combustion chamber) be constituted by a microstructure metal (col. 15, lines 10-15). Moreover, Horne teaches that the use of rare earths of well known in the art as material commonly used for achieving selective emission (col. 1, lines 23-30) and this it would have been obvious to one of ordinary skill in the art to use rare earths as the lining as it has been held that selection of a known material based on its suitability for its intended purpose is within the general skill of as worker in the art (MPEP 2144.07).

Regarding claims 7-8, Horne is silent to the specific dimensions of the device components and thus is silent to the outer surface of the combustion chamber having

such a total area that the radiant energy emitted by the emission means is equal to the sum of the total thermal energy developed by the combustion reaction at steady state and of the fraction of radiant energy that is reflected by the inner walls of the conversion chamber or by the conversion means and reabsorbed by the combustion chamber (claim 7) and the conversion chamber has axes whose size ranges between 3 and 50 times the diameter of the combustion chamber (claim 8).

It would have been obvious to one of ordinary skill in the art at the time of the invention to make the outer surface of the combustion chamber having such a total area that the radiant energy emitted by the emission means is equal to the sum of the total thermal energy developed by the combustion reaction at steady state and of the fraction of radiant energy that is reflected by the inner walls of the conversion chamber or by the conversion means and reabsorbed by the combustion chamber in Horne in order to optimize the conversion efficiency of the system as it has been held that the mere change in size of components and the discovery of an optimum value of a result effective variable are within the general skill of a worker in the art (MPEP 2144).

Regarding claim 17, Horne teaches that the exhaust conduit are made of a material with low thermal conductivity (col. 13, lines 22-24) but is silent to the injection conduit and the conduit for supplying the combustion support substance being made of a material with low thermal conductivity.

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the low thermal conductivity throughout the conduits in Horne in order

to reduce heat and efficiency losses in combustion as Horne teaches the importance of saving costs by using preheated fuel and air supplies (col. 12, lines 29-32 and 53-64).

Regarding claim 18, Horne teaches that the outermost segment of the exhaust conduit is made of a material with high thermal conductivity to allow combustion products to yield the residual heat before exiting the conversion chamber (col. 12, lines 36-47).

Regarding claim 20, Horne teaches that the injection of the combustion support substance ends into the injection conduit before entering the combustion chamber (col. 12, lines 65-67).

Regarding claim 23, Horne teaches that the surface of the photovoltaic cells (190) facing the interior of the conversion chamber has an optical lining (band pass filter (218)) with transmittance peak in correspondence with the wavelength at which the photovoltaic cells have the maximum conversion efficiency (figure 43, col. 11, line 61) but is silent to the use of an optical lining operating on the long wavelengths of the electromagnetic radiation as a band pass filter.

Regarding claim 28, Horne teaches that the gaseous fuel injected is a natural gas (col. 11, lines 40-45).

Regarding claim 31, Horne teaches that the injection conduit (15) has an articulated path in order to prevent the combustion products to return towards the injection means.

12. Regarding claim 33, Horne teaches that a vacuum is obtained inside the conversion chamber (col. 11, lines 62-64).

13. Claims 2-3 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Streetman (US 6372979)

Regarding claim 2, Horne teaches the use of a semi-ellipsoidal shape with a energy source located at the focal point of the elliptical cavity (col. 14, lines 16-18) but is silent to the combustion chamber having a spherical shape.

Streetman teaches the use of a combustion chamber within a conversion chamber wherein the combustion chamber has a spherical shape (figure 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the spherical shape of Streetman in Horne because spheres maximize available space compared to cylinders.

Regarding claim 3, modified Horne teaches that the solar cells are positioned on a planar surface (Horne: 190, figure 43) that is perpendicular to the greater axis of the ellipsoid and passes through the centre of the ellipsoid itself (Streetman: figures 1-4). Streetman teaches that the placement and shape of these components is a matter of design choice to provide the desired magnification (col. 4, lines 9-25).

Regarding claim 19, Horne is silent to the injection conduit and the means for injecting the combustion support substance independently end into the combustion chamber.

Streetman teaches separate injection of fuel into the combustion chamber (17, figure 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the separate injection conduit of Streetman in Horne because separate conduits offer more control over fuel.

14. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Fischbeck (US 3924974)

Regarding claims 8-10, Horne is silent to the injector being a ”bubble” ink-jet type.

Fischbeck teaches the use of ink-jet injectors for combustion chambers (col. 5, lines 25-40).

It would have been obvious to one of ordinary skill in the art at the time of use the “bubble” ink-jet injector of Fischbeck because the volumetric change provided by the ink-jet printer is hundreds of times greater than that or prior art structures, as taught by Fischbeck (col. 7, lines 49-57).

15. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Yoshinaga (JP 58180767)

Regarding claim 11, Horne is silent to an injection head being piezoelectric.

Yoshinaga teaches the use of a piezoelectric driver for injectors (abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the piezoelectric head of Yoshinaga in the injection means of Horne because the piezoelectric element accelerates the combustion of fuel, as taught by Yoshinaga (purpose).

16. Claims 12 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Wagner (US 3779212)

Regarding claims 12 and 15-16, Horne is silent to he combustion chamber being constituted by a material with high thermal conductivity and able to withstand high temperatures (claim 12), a metallic material (claim 15) and that material being tungsten of molybdenum (claim 16). However, the Examiner asserts that one of ordinary skill in the art would appreciate that a combustion chamber must withstand high temperatures and would select a known material for this purpose.

Wagner teaches that materials such as tungsten and molybdenum are used in combustion chambers because they are convention high temperature materials (col. 4, lines 1-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the materials of Wagner in Horne for the combustion chamber because these materials can withstand the high temperatures of combustion, as taught by Wagner (col. 4, lines 1-7) especially since it has been held to be within the general skill of a worker in the art to select a known material based on its suitability for an intended use (MPEP 2144.07).

17. Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of DE'743 (DE 5620131).

Regarding claims 13-14, Horne is silent to the inner surface of the combustion chamber being coated with a porous material with low thermal conductivity, able to withstand high temperature and coated with a catalyzing material.

DE '743 teaches the inner surface of the combustion chamber being coated with a porous material with low thermal conductivity, able to withstand high temperature and coated with a catalyzing material (abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the material of DE'743 in Horne because the lining reduces noxious emissions, as taught by DE'743 (abstract).

18. Claims 21-22, and 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claims 1 and 33 and further in view of Nelson (US 4584426).

Regarding claims 21-22, 35-37, Horne is silent to the conversion chamber being formed within a structure made of optically polished metallic material, reflecting over the whole spectrum of the radiation emitted by the emission means.

Nelson teaches a thermophotovoltaic system in which the combustor (mantle) is housed within a structure made of polished metallic material (col. 6, lines 45-47).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the polished metallic structure of Nelson in Horne because the reflective structure reflects unabsorbed light back into the device rather than waste the energy.

Further regarding claim 22, modified Horne is silent to the optically polished material being coated on a plastic or ceramic.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a plastic or ceramic coated with highly reflective material in Horne because using a coating allows for the bulk of the structure to be made from less expensive materials such as plastic.

Further regarding claim 36-37, modified Horne is silent to the optically polished material being a ceramic.

It would have been obvious to one of ordinary skill at the time of the invention to use a polished ceramic because polished ceramic can withstand high temperatures and will reflect unabsorbed radiation over the whole spectrum emitted by the emission means back into the system, especially since it has been held to be within the general skill of a worker in the art to use a known material based on its suitability for its intended use (MPEP 2144.07).

19. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Ikai (US 5620531).

Regarding claims 24-25, Horne is silent to the use of a solar cell based on Schottky junctions comprising silicon and aluminum.

Ikai teaches that pn-, pin-, and Schottky junction solar cells are equivalents known in the art (col. 23, lines 35-37), wherein the Schottky junction comprises aluminum as the metallic component (col. 23, lines 41-43) but is silent to the

semiconductor. Andriesh teaches that aluminum on amorphous silicon produces Schottky devices.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the Schottky junction solar cell of Ikai and Andriesh in Horne because Schottky devices are known to be faster than pn- or pin- devices, as taught by Andriesh (page 351) especially since it has been held to be within the general skill of a worker to select a known material based on its suitability for its intended use (MPEP 2144.07).

20. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 23 and further in view of Fraas (US 5403405).

Regarding claim 26, Horne is silent to the optical lining is made of a material selected from the group comprising: multilayer dielectric lining, metallic lining at the percolation state, metallic photonic crystal, anti-reflection micro-structure.

Fraas teaches the use of a multi layered dielectric layer for filtering in thermophotovoltaics (claim 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the miltilayer dielectric layer of Fraas in Horne because the multilayer can withstand high temperatures (claim 1).

21. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Nakanishi (US 6295937).

Regarding claim 27, Horne is silent to the injection device being a miniaturized Bunsen burner.

Nakanishi teaches the use of a Bunsen burner injection device (col. 12, lines 60-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a Bunsen burner as an injection device because bunsen burners gasify liquid fuels (col. 12, lines 60-67).

22. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Yoshida (US 4090482).

Regarding claim 29, Horne is silent to the exhaust conduit being internally coated with catalyzing material able to neutralize the noxious products of the combustion reaction.

Yoshida teaches catalyzing material in an exhaust pipe for a combustion apparatus (claim 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the exhaust conduit of Yoshida in Horne because the catalyzing material reduces noxious chemicals (claim 1).

23. Claims 30, 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horne (US 5611870) as applied to claim 1 and further in view of Noreen (US 5512108)

Regarding claim 30, Horne teaches that the exhaust conduit has path in order to favor the cooling of the exhaust gas (col. 12, lines 40-45).

Noreen teaches the use of articulated exhaust paths (col. 12, line 56).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the articulated paths of Noreen in Horne because improve efficiency (col. 12, lines 50-54).

Regarding claim 32, Horne is silent to spark ignition.

Noreen teaches that spark ignition is the conventional method of igniting the combustion chamber in thermophotovoltaics (col. 5, lines 9-10).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the spark ignition of Noreen in Horne because one of ordinary skill would appreciate that spark ignition is a simply method for igniting the combustion chamber.

Regarding claim 34, Horne teaches a sub atmospheric chamber (col. 11, lines 62-64) but is silent to the use of an inert gas sub atmospheric pressure chamber.

Noreen teaches the use of an inert gas as an alternative to a vacuum (col. 16, lines 42-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use an inert gas at sub atmospheric pressure in order eliminate oxygen from being absorbed by photons, as taught by Noreen (col. 16, lines 42-48).

24. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horne and Noreen as applied to claim 34 and further in view of Nelson.

Horne and Noreen are silent to the conversion chamber being constituted by an optically polished ceramic material.

Nelson teaches a thermophotovoltaic system in which the combustor (mantle) is housed within a structure made of polished metallic material (col. 6, lines 45-47).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the polished structure of Nelson in Horne because the reflective structure reflects unabsorbed light back into the device rather than waste the energy, moreover it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute an art known equivalent material such as ceramic for the metal material in modified Horne for its intended use as a reflector and waste recovery means as an obvious design choice (MPEP 2144).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MIRIAM BERDICHEVSKY** whose telephone number is (571)270-5256. The examiner can normally be reached on M-Th, 10am-8pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/M. B./
Examiner, Art Unit 1795

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